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Big Bang afterglow reveals dark energy's repulsion

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Will Knight

Observation of the cosmic radiation emitted just after the Big Bang has revealed further evidence for the Universe's mysterious and elusive dark energy.

Astronomers from the Sloan Digital Sky Survey, the University of Pittsburgh and Carnegie Mellon University in the US studied the cosmic microwave background (CMB) radiation, the faint but pervasive afterglow of our Universe's explosive beginnings.

The team analysed changes in the energy of CMB photons caused by the gravity of massive concentrations of galaxies. As photons pass through these galactic masses, gravitational potential causes them to gain and then lose energy. Once the photon has passed through, the energy changes should have cancelled out.

But the CMB photons studied had slightly higher energy levels on leaving the galaxy concentrations. This change can only be explained by invoking the influence of dark energy in the expansion of these massive galactic structures.

"This is extremely exciting," says Ryan Scranton, of the University of Pittsburgh. "We spent a lot of time testing the data against contamination from our galaxy or other sources. Having the results come out as strongly as they did was extremely satisfying."

Age difference

Andrew Connolly, also at Pittsburgh, says future measurements of galactic congregations of different ages may enable astronomers to test theories of how dark energy has changed over time. "There's obviously a lot more sky we could look at," he says.

The nature of dark energy remains largely a mystery, but the repulsive force it generates is for responsible for the accelerating expansion of the Universe. The first evidence for this acceleration was found in 1999 when distant supernovae were discovered further away than could be explained by a steady expansion rate.

"In recent years we are finding that most of the stuff in our Universe is abnormal in that it is gravitationally repulsive rather than gravitationally attractive," adds Albert Stebbins, at the Fermi National Accelerator Laboratory.

The researchers analysed about 10 per cent of the sky, combining images of around 30 million galaxies from the Sloan Digital Sky Survey (SDSS) with CMB temperature data from NASA's orbiting Wilkinson Microwave Anisotropy Probe (WMAP). The CMB photons studied were produced just 380,000 years after the Universe was born.

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